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ABSTRACT

The relationship between background characteristics and salaries of male and female college graduates was assessed, and causes for salary differences were investigated. Data were drawn from the 1981 Survey of 1979-80 College Graduates, which covered individuals who received bachelor's or master's degrees from July 1, 1979, to June 30, 1980. A sample of 15,852 graduates from a nationally representative sample of 286 institutions was selected. The average salary in May 1981 for full-time employed male college graduates was $17,000, compared to $13,400 for females. The salary differences between male and female graduates were analyzed using a descriptive approach, regression analysis, and the decomposition-of-means technique. It was found that men outnumbered women in the high-paying occupation and major field categories, while women outnumbered men in the low-paying categories. While half the difference in predicted salary was attributed to women choosing lower-paying industries and occupations, the other half appears attributable to a lower rate-of-return for females compared to males on all predictor variables. Extensive appendices provide statistical findings and information on predictor variables, the survey and sampling procedures, frequency distributions and salaries categorized by occupation, major field of study, industrial grouping, marital status, region, race/ethnicity, and full-time work experience. (SW)

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Salary Comparisons of 1979-80 College Graduates, by Sex in May 1981

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Analytic Report

Salary Comparisons of 1979-80 College Graduates, by Sex in May 1981

Jane L. Crane

National Center for
Education Statistics

Analytic Report

3

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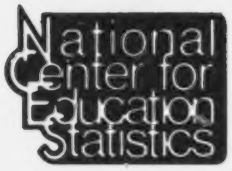

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Foreword

This report has two purposes. First, it examines the relationship between background characteristics and salary for males and females who graduated college in 1979-80 and were working in May 1981. Second, it attempts to gain insight into the causes of the difference in salary which exists between the sexes 1 year after graduation.

The data for this report are drawn from the 1981 survey of 1979-80 College Graduates conducted in October 1981. The survey covered individuals who received bachelor's or master's degrees from July 1, 1979, to June 30, 1980. This was a two-stage sample survey. A nationally representative sample of 286 institutions was selected, and from these 15,852 graduates were sampled.

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December 1984

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I. Introduction

Executive Summary

The average salary in May 1981 for full-time employed 1979-80 male college graduates was $17,000 compared with $13,400 for females. The first purpose of this report is to examine separately the determinants of salary for those male and female graduates. The second purpose is to investigate the sources of the salary difference between them.

The data for this report are drawn from the 1981 Survey of 1979-80 College Graduates conducted by the National Center for Education Statistics (NCES). The survey obtained data from a sample of bachelor's and master's recipients 1 year after graduation on items such as employment characteristics, academic history, and general background.

Initially, the report examines mean salary, by sex, for each category (level) of a potential variable. This step establishes a set of salary-relevant characteristics. The variables selected for further examination are occupation, major field of study, industry grouping, marital status, enrollment status (e.g., graduate school), region, metropolitan status, major field/job-relatedness, degree level, college selectivity, race, and experience.

This step also reveals general patterns in the data. Male and female salaries follow a pattern similar to two parallel lines rising and falling with changes in the category of a variable. Those variable categories associated with higher (or lower) salaries for men are also associated with higher (or lower) salaries for women, but usually a significant distance apart. In addition, males frequently predominate in the high-paying categories of a variable, while females predominate in the low-paying categories. Occupation and major field of study are good examples of this general pattern.

Examining one variable at a time is limited, however. These salary-relevant characteristics are highly interrelated, and this type of analysis does not control for the effects of related variables.

A second approach used to deal with the problem of interrelated variables is regression analysis, which permits the effect of one variable to be studied while the other variables are controlled. Separate models are developed for males and females to fulfill the first purpose of this study, that is, to examine individually the determinants of salary for male and female recent college graduates.

The model for male graduates reveals the following salary-relevant characteristics (values of the predictor variables) to be strongly associated with <u>higher</u> salaries for males:

- Having a master's degree;
- Being employed as a business person, manager, engineer, computer scientist, or health professional; and
- Working in an industry that falls under the heading of either production and trade or transportation, communications, and utilities.

Strongly associated with lower salaries in the male model are the following characteristics:

- Enrolled full-time in college (e.g., in graduate school); and
- Working in a job unrelated to their major field of study.

The model for females reveals the same list of characteristics associated with higher salaries as the model for males, but adds a few others:

- Being employed in fine arts;
- Working in an industry that falls under the heading of insurance, credit, banking and real estate; health service; or government service; and
- Living in the Far West region of the United States.

Those characteristics strongly associated with lower salaries in the female model are:

- Being employed in public affairs or in a non-professional job; and
- Working in a job unrelated to their major field of study.

The unique set of salary determinants for males and females are revealed by examining each model separately. Separate inspection, however, does not address the second purpose of this study; that is, to investigate the reasons for the salary difference between the sexes. Some insight into the sources of their salary difference can be gained in a two-step process of interchanging the elements (regression coefficients and average predictor values) of the two regression equations. First, the regression coefficients in the male and female models are interchanged (male regression coefficients are used with female observations, female coefficients with male observations) and new predicted salaries are obtained. The new predicted salary for females is higher than in the original female model and the new predicted salary for males is lower than in the original male model. What this shows is that males and females change their salary-relevant characteristics into earnings at different rates (females at a lower rate than males). For example, the regression coefficient for an occupation in business and management is lower in the female model than in the male model. This means that women receive a lower rate-of-return (i.e., lower salary) on an "investment" in an occupation in business and management compared to men. Lower rates-of-return on the same salary-relevant characteristics account for about half the difference in salary between these male and female graduates.

In the second step, average values for the predictor variables are interchanged. (One at a time, the average male value for a predictor is substituted in the female equation; then the process is reversed, with the female predictor values being substituted in the male equation). A new predicted salary is calculated after each variable is substituted,

and changes in predicted salary are noted. When the male distributions[1] replace the female distributions for the occupation and industry variables, the predicted salary for females increases substantially. When the female values for these variables replace the male values, the predicted salary for males decreases by a similar amount. What this shows is that males tend to enter high-paying occupations and industries, while females tend to enter low-paying occupations and industries. This difference in occupation and industry accounts roughly for the other half of the difference in predicted salary between the 1979-80 male and female college graduates in this survey.

Background and Purpose of the Study

Over the years, numerous studies have examined the difference in earnings between men and women. Suter and Miller (1973) found that, while the relationship of income with socioeconomic characteristics is more consistent for women than for men, women receive decidedly lower pay increments for equal step increases in educational level and occupational status. In addition, after taking many factors into consideration (e.g., occupational status), they found that (in 1969) the prevailing wage for women was about 39 percent of that for men. More recently, Beck, et al. (1978a) and others (Bibb and Form 1977; Hodson 1978) accounted for this difference in incomes by examining the different labor markets men and women tend to enter and the different value placed on education and experience within these markets. Similarly, a paper presented at the Economic Council of Canada Conference on Incomes (1979) revealed that full-time Canadian female workers earned 62 percent of the pay received by full-time Canadian male workers. The study showed that female workers earned less than the male workers, because they did not benefit from their income-relevant characteristics in the same way as did the males.

The studies noted above examined the differences in earnings between men and women across all classifications of workers over their entire working lives. This analysis seeks to find out if these same differences exist for full-time employed recent college graduates at the beginning of their careers. These men and women attained their bachelor's or master's degrees in 1979-80 and were surveyed in May 1981, approximately 1 year after graduation.

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[1]Proportions of males in each category.

The salary-relevant characteristics used in this study are as follows: occupation, industry grouping, marital status, enrollment status (e.g., graduate school), major field of study, metropolitan status, degree level, region, major field/job-relatedness, college selectivity, race, and years of experience. These characteristics were chosen because other studies and preliminary data analysis showed that salaries often varied by these characteristics. Several characteristics may require a definition:

Major field/job-relatedness is a variable aimed at measuring the salary payoff for obtaining a job in one's major field. It is measured by a five-category response (always, frequently, sometimes, rarely, never) to the questionnaire item, "How frequently in your principal job did you use the content of courses in your major field?"

College selectivity is a three-category variable (not selective, moderately selective, and highly selective) based on a composite index from median SAT (Scholastic Aptitude Test) or ACT (American College Test) scores, the high school grade-point average of the freshman class, and an "open" admission policy. The index comes from the ACT College Planning Search Book, 1977-78 edition, published by the American College Testing Research Program.

Metropolitan status is a five-category variable: not in standard metropolitan statistical area (SMSA); small SMSA (not central city); small SMSA (central city); large SMSA (not central city); and large SMSA (central city).

Data Source

The data for this report come from the 1981 Survey of 1979-80 College Graduates conducted by NCES. The survey obtained data from a sample of college graduates 1 year after graduation. The survey used a two-stage sample procedure, the first stage being a sample of institutions offering bachelor's and master's degrees and the second being a sample of graduates from the sampled institutions. Graduates in the sample received mail questionnaires with items covering their academic backgrounds, current principal job, and general background. A description of the sampling procedures, sample sizes, response rates, and estimation procedures can be found in appendix C.

Because the data were collected from a sample, all figures reported here are estimates subject to sampling error. See appendix E for more information.

Geometric Means for Salary

Two steps have become accepted practice in regression analysis involving the relationship between salary and salary-relevant variables. First, one transforms salary into the logarithmic scale; then one expresses the relationship of these variables to salary as a semi-logarithmic function (see Beck et al. 1978a, 1978b; Stolzenberg 1975; Mincer 1974). The use of the logarithm of salary is much more consistent with the

assumptions[2] of the type of regression models employed here and provides an improved fit of the data to the model. However, this implies that what is being modeled is not the graduate's salary but the natural logarithm of that salary. The result is a slight distortion in what is ordinarily thought of as an average salary. This is so because the arithmetic average of the log salaries transformed back to salary by taking the antilog is not equal to the arithmetic mean of the salaries. Rather, this average is actually the geometric mean. It is neverlarger than the arithmetic mean. For example, the arithmetic mean salary for bachelor's degree recipients in the sample for this report was $15,160. The geometric mean for this same group was $14,021.

Although the arithmetic mean or the median is the measure of central tendency usually associated with descriptive statistics on salary data, these measures are not used in this report.

A descriptive approach (i.e., examining mean salary by sex for each salary-relevant characteristic) is included in this report only to illustrate general trends associated with each variable.

Discussion of these findings is brief since this approach has serious limitations (see section II). Since the geomtric mean was the preferred measure for fitting the regression models, all average salaries reported here are geometric means to make the report consistent and simple.[3]

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[2]Two basic assumptions are implied here:

a. Log salary is a linear function of the salary-relevant characteristics, plus a random error; and

b. The quantity $E(Y-Y')^2$ is the same for all values of X (assumption of homoscedasticity, or the condition of uniform dispersion of points along the regression line).

[3]An obvious advantage of using the geometric mean in the descriptive tables is that it is less affected by extremes in the data than is the arithmetic mean.

II. A Comparison of the Mean Salary of Males and Females, by Salary-Relevant Characteristics

The average salary in May 1981 for full-time employed 1979-80 male college graduates was $17,000 ($16,100 to $17,900) compared to $13,400 ($12,700 to $14,100)[1] for females. At least part of this difference may be explained by the fact that the salary-relevant characteristics (e.g., occupation distribution) of the two groups differ substantially, with males possessing more of those characteristics associated with higher salaries. The salary-relevant characteristics available on the file, as described in appendix A, are: occupation, industry grouping, major field/job-relatedness, degree level, college selectivity, race/ethnicity, years of experience, marital status, enrollment status, major field of degree, metropolitan status, and region.

Some insight into the overall salary difference between males and females may be gained by inspecting their differences in mean salary and in category membership for each salary-relevant characteristic (tables B1-B9). This approach is limited, however, by the substantial interrelations among the variables (see appendix D). This problem is best illustrated by an example. Graduates with master's degrees earn considerably higher salaries than those with only bachelor's degrees (table B8). The degree variable, however, is highly correlated with years of experience (r=0.35 for males and 0.47 for females -- tables D1 and D2).

It is impossible to know, therefore, just by looking at table B8 whether mean salary differences between degree levels are attributed primarily to the degree, to the years of experience that elapsed between earning the degrees, or to both. Nevertheless, some insight may be gained by inspecting these tables[2] (appendix B).

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[1]These salary ranges are the 95 percent confidence intervals for the average salary estimates. See appendix E for more information.

[2]Some categories of certain variables held only a few graduates. In these categories, the reported mean salaries are subject to greater variability. Use caution in making comparisons when the sample size is less than 40.

The following are highlights from those tables:

- In general, occupations that pay better (or worse) salaries for males also pay better (or worse) salaries for females. Engineering,[3] computer science, health professions, and business and management occupations paid salaries at the high end of the salary continuum for both sexes. Education-related occupations and those in public affairs, on the other hand, paid salaries at the low end. In most of these occupations, whether high- or low-paying, however, males still earned greater salaries than females.

  It is important to note that males and females predominate in different fields. Females outnumber males by almost 3 to 1 in education-related occupations and by 2 to 1 in public affairs. Females are in the minority in engineering and business and management. In the high-paying health occupations and the computer science field, however, males do not predominate. Women and men are about equal in number in the computer field, and women outnumber men by more than 4 to 1 in the health occupations category (table B1).

- For major field of study, a pattern similar to that for occupation exists; that is, male and female salaries fluctuate in parallel but usually a sizable distance apart. Similarly, females, for the most part, predominate in the low-paying categories, males in the high-paying ones (table B2).

- The transportation, communication and utilities industry grouping paid salaries at the high end of the continuum for both sexes, while the education service industry paid salaries at the low end. In both these industry groupings, males earned significantly more than females (table B3).

- Married males and females earn more than the unmarried, with males earning more than females in both categories (table B4).

- Enrollment status appears not to be associated with higher or lower female salaries. Full-time enrollment for males, however, is associated with significantly lower salaries. Full-time enrolled males do not earn significantly different salaries than full-time enrolled females, although part-time enrolled and non-enrolled males do earn significantly more (table B4).

- Across all metropolitan status and region categories, males earn more than females. For males and females, salaries at the low end of the continuum were paid in non-SMSA's and at the high end in large SMSA's. Geographically, salaries at the high end of the continuum for males and females occurred in the Far West (tables B5 and B6).

---

[3] n=27 for females in engineering occupations. Use caution with this estimate.

- "Rarely or never" using major field coursework on the job (a response indicating little major field/job-relatedness) appears to be associated with the lowest salaries for both sexes. Males earned significantly more than females in these categories (table B7).

- A master's degree adds significant increment to both male and female salaries. Although males earn more in each category, the ratio of bachelor's salary to master's salary is the same for both sexes (about 75 percent -- table B8).

- Experience appears to be related to male and female salaries similarly; the more years of experience (as one might expect), the higher the salary. Although males earn more across all categories, graduates in the least-experienced category earn 70 percent of those in the most-experienced category, regardless of sex (table B9).

III. Log Salary Regression Approach

Discussion of Regression Approach

Regression analysis is used here for modeling the relationship between the dependent variable (log salary) and the set of predictor variables called salary-relevant characteristics (see appendix A). The regression models proposed for this study assume that log salary is a linear function of the salary-relevant characteristic, plus a random error. Regression analysis overcomes the weakness of the one-variable-at-a-time approach of the previous section by studying log salary for the joint set of salary-relevant characteristics.

The first step in the regression analysis was to develop separate regression models for male graduates and female graduates which fit the observed data.[1] Separate models were created, rather than one with sex as a variable, to permit an examination of the determinants of salary for each sex. Many models were examined before the final models were selected. All of the salary-relevant characteristics available were used in those exploratory models. The final models were chosen because they exhibited the best fit to the data (highest proportion of variance accounted for in log salary) with the fewest possible salary-relevant characteristics. The fit of the models was judged by the coefficient of determination (R^2).

Both male and female models had an R^2 of approximately 0.50.[2] They shared the following predictor variables (each term exceeded the 0.01 level of significance): degree level, years of experience, squared years of experience, major field/job-relatedness, industry grouping, metropolitan status and occupation. In the male model, marital status and enrollment status accounted for a significant proportion of the variability in log salary. In the female model, college selectivity and region accounted for a significant proportion of log salary. These models are presented in subsequent sections.

After the regression models were established, it was possible to analyze the determinants of male and female log salaries by examining the relative effect on salary of each of the predictor variables in the model. This was accomplished by establishing an arbitrary reference group (graduates who shared membership in the largest category of each predictor variable) and noting the predicted salary of this group. One characteristic of the reference group was then changed, and the new predicted salary was noted. The percentage change from the first salary to the second showed the relative and isolated effect of this one characteristic on the salary of the reference group.

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[1] Regression coefficients and their standard errors for these models are found in appendix F.

[2] Under cross-validation, using the same regression equation, R^2 would be expected to be lower.

The basis for this technique is derived from the fact that the models give log salary as a linear combination of the predictor variables. A change in the reference group from one category of a variable to another category results in a specific increment (or decrease) in log salary for the model. When the log salary is transformed to salary, the change is a percentage change. These percentage changes in the model are the focus of sections III B and C.

After the determinants of male and female log salaries have been established, the decomposition-of-means technique (Althauser and Wigler 1972; Winsborough and Dickinson 1971) is used to account for their difference in salary (section III D). With this technique, the difference in mean salary for males and females is divided into two components: one is associated with differences in salary-relevant characteristics (the predictor variables in the model); the other is associated with rate-of-return on those characteristics (the regression coefficients[3] associated with each independent variable).

These components are derived in a two-step process of interchanging the elements (regression coefficients and average predictor values) of the two regression equations. First, regression coefficients in the male and female models are interchanged (male regression coefficients are used with female observations; female regression coefficients are used with male observations). New predicted salaries are thus obtained. This step will show whether or not males and females change their salary-relevant characteristics into earnings at the same rate. If females, for example, have a higher predicted salary using the male regression coefficients while retaining their own characteristics (average female predictor values), this step will show that males receive a higher rate-of-return on a given set of characteristics compared to females.

In the second step, average values for the predictor variables are interchanged. (One at a time, the male average value for a predictor is substituted in the female equation; then the process is reversed, with the average female predictor values being substituted in the male equation). A new predicted salary is calculated after each variable is substituted and changes in predicted salary are noted. This step will show the impact on salary of the different salary-relevant characteristics of each sex. For example, if the male's occupational distribution is substituted for the female's and the predicted salary for females increases, this step will show that male occupational characteristics contribute to their higher salary.

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[3]Note that a different combination of predictor variables could yield significantly different regression coefficients. Regression coefficients for these predictors and the standard errors are found in appendix F.

Regression Model for Males

In this section, the determinants of male log salary are established. The variables included in the regression equation for males accounted for 50 percent of the variability in log salary. All of the variables[4] that follow were included in the model (each term exceeded the 0.01 level of significance): marital status, degree level, years of experience, the square of years of experience, major field/job-relatedness, industry grouping, metropolitan status, enrollment status, occupation. Also included were these interaction terms: (square of years of experience) x (occupation), (occupation) x (metropolitan status), and (occupation) x (race/ethnicity).

After the models were established, it was possible to analyze the effect on salary of the different categories of the salary-relevant characteristics. This was done by measuring their relative effect on the predicted salary of an arbitrary reference group. The characteristics of the reference group to which all category changes were compared were: bachelor's degree, zero years of experience, education occupation, large SMSA (non-central city), high degree of major field/job-relatedness, (i.e., almost always used major field coursework on the job), education service industry, not enrolled, not married, white race, and education major. The magnitude of the effect on salary of the reference group of a particular predictor/category is depicted by changing one characteristic of this reference group and comparing the percent difference in salaries before and after the change. Table 1 shows the percent change in salary due to changing the category of one predictor variable from the reference group. Details of how these changes were calculated are summarized below.

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[4]Race was also included by itself, since this was a hierarchical model, but it was not significant. Major field (grossly separated into education/noneducation) was included to account for the oversampling of education majors. It also was not significant.

Table 1.--Effect of level of predictor variable on salary for males, using the male model

Predictor variable	Change in level of predictor variable	Percent change in salary due to change in level of predictor variable
Degree	Bachelor's to master's	+29
Experience	For each year	+ 3
Occupation	In education to occupation in business and management	+26
	In education to occupation in engineering	+53
	In education to occupation in health	+59
	In education to occupation in public affairs	- 2
	In education to occupation in biological and physical science	+26
	In education to occupation in fine arts	+21
	In education to occupation in social science and psychology	+ 6
	In education to occupation as research worker	+ 3
	In education to occupation in communications	+17
	In education to occupation as computer scientist	+39
	In education to occupation as technician	+20
	In education to occupation in other professional category	+37
	In education to occupation in nonprofessional category	+20
Industry grouping	Education service to production and trade	+23
	Education service to transportation, communications, utilities	+29
	Education service to insurance, credit, banking, real estate	+ 6
	Education service to entertainment and service (including: personal, business, and repair)	+15
	Education service to health service	+ 5
	Education service to legal, social, and miscellaneous service	+ 6
	Education service to government service	+10
Metropolitan status	Large SMSA (not central city) to not in SMSA	- 3
	Large SMSA (not central city) to small SMSA (central city)	- 5
	Large SMSA (not central city) to small SMSA (not central city)	- 4
	Large SMSA (not central city) to large SMSA (central city)	+ 2
Major field/ job-related-ness, defined by: Use of major field course-work in principal job	Almost always to frequently	+ 1
	Almost always to sometimes	- 1
	Almost always to rarely	- 9
	Almost always to never	-17
Enrollment status	Not enrolled to full-time enrolled	-17
	Not enrolled to part-time enrolled	- 3
Marital status	Not married to married	+11

These percent changes were calculated using table F1 in the appendix. The predicted log salary for the reference group is equal to the coefficient estimate for the intercept. The coefficient estimate for each category of a predictor is the amount of log salary that would be added to the intercept if the reference group possessed that characteristic. As an example of estimating the percent change that would occur if one characteristic of the reference group were altered, consider the change from bachelor's degree to master's degree in the reference group (+29 percent). To arrive at this percent, one must:

1. Transform the log salary for the reference group to actual salary (9.37 log dollars to 11,731 actual dollars).

2. Transform to actual dollars the sum of the log salary for the reference group and the coefficient in log dollars for master's degree (9.624 log dollars (9.37 + 0.254) to 15,123 actual dollars).

3. Calculate the percent change in actual dollars ((11,731-15,123)/11,731)x100 = 29 percent.

Unfortunately, table 1 does not provide a direct method of measuring the percent change in salary resulting from the change from the reference group in two or more predictor variables. This must be kept in mind when looking at the results of table 1. This comparison to reference group technique can be found in Burkheimer, Jaffe and Peng 1980. See section III-A for a discussion of this technique.

The following predictor/category changes[5] are associated with large percent decreases in male salary (relative to the reference group):

- almost always using to never using major field coursework on job. (-17 percent);
- not enrolled in college to full-time enrolled (-17 percent).

The following predictor/level changes[6] are associated with large[7] percent increases in male salary (relative to the reference group):

- bachelor's degree to master's (+29 percent);
- occupation in education to occupation in business and management (+26 percent);
- occupation in education to occupation as engineer (+53 percent);
- occupation in education to occupation as computer scientist (+39 percent);

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[5]Only changes involving cell sizes (seen in tables B1-B9) greater than n=40 are discussed.

[6]See note 5 above.

[7]When the salary for a predictor/category was considerably below the male mean, e.g., education occupation (as seen in tables B1-B9), a larger percent increase was necessary to merit discussion.

- occupation in education to occupation as health professional (+59 percent);

- education service industry to production and trade industry (+23 percent);

- education service industry to transportation, communications, utilities industry (+29 percent).

Regression Model for Females

In this section, the determinants of female log salary are established. The variables included in the female regression model explained 47 percent of the variability in log salary. All of the variables and interaction terms listed below were included in the model (each exceeded the 0.01 level of significance): degree level, years of experience, squared years of experience, major field/job relatedness, selectivity of college[8] metropolitan status, occupation, region, industry grouping, (race/ethnicity) x (region), (degree) x (race/ethnicity), (occupation) x (SMSA status).[9]

Table 2 shows how much a particular predictor/category can affect the salary of the reference group. The characteristics of the reference group to which all category changes are compared were: bachelor's degree, zero years of experience, education occupation, large SMSA (not central city), high level of major field/job-relatedness (i.e., almost always used major field coursework on the job), education service industry, moderately selective college, white race, majored in education, Mideast region of the U.S. (See section III B for details on how, by altering one category of one variable in the reference group, the percent change in salary was calculated.)

The following predictor/category changes[10] are associated with large percent decreases in female salary (relative to the reference group):

- occupation in education to occupation in public affairs (-10 percent);

- occupation in education to occupation in nonprofessional category (-10 percent);

- almost always using to never using major field coursework on job (-13 percent).

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[8]Exceeded 0.05 level of significance.

[9]Race/ethnicity was also included by itself, since this was a hierarchical model, but it was not significant. Major field, grossly separated into education/non-education, was included to account for the oversampling of education majors. It was significant at the 0.0001 level.

[10]Only changes involving cell sizes greater than n=40 are discussed.

The following predictor/category changes[11] are associated with large[12] percent increases in female salary (relative to the base group):

- bachelor's degree to master's (+30 percent);
- occupation in education to occupation in business and management (+14 percent);
- occupation in education to occupation in health (+21 percent);
- occupation in education to occupation as computer scientist (+53 percent);
- occupation in education to occupation in fine arts (+19 percent);
- education service industry to transportation, communications, utilities industry (+35 percent);
- education service industry to insurance, credit, banking, real estate industry (+19 percent);
- education service industry to health service industry (+16 percent);
- education service industry to government service industry (+16 percent);
- Mideast to Far West (+11 percent).

The statements preceeding table 1 also apply to table 2. In particular, the findings refer only to one variable change in the reference group.

Decomposition of Means for Salary

The decomposition-of-means technique is discussed in section III A. It is used to predict what the mean female salary would be if females: (1) changed their salary-relevant characteristics into earnings at the same rate as males, and (2) possessed some of the more important male salary-relevant characteristics. It is also used to predict the mean salary for males if they did the same: that is, if males changed their salary-relevant characteristics into earnings at the same rate as females and possessed some of the more important female salary-relevant characteristics. This approach partitions the log salary difference into two portions: the one due to differences in salary-relevant characteristics (predictor variables), and the one associated with differences in rate-of-return on those salary relevant-characteristics (regression coefficients). All findings are valid only if the regression models are appropriate.

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[11] See note 10 above.

[12] When the reference group predictor/category salary was considerably below the female mean (as seen in tables B1-B9), a larger percent increase was necessary to merit discussion.

Table 2.--Effect of category of predictor variable on salary for females, using the female model

Predictor variable	Change in category of pridictor variable	Percent change in salary due to change in level of predictor variable
Degree	Bachelor's to master's	+30
Experience	For each year	+ 2
Occupation	In education to occupation in business and management	+14
	In education to occupation in engineering	+57
	In education to occupation in health	+21
	In education to occupation in public affairs	-10
	In education to occupation in biological and physical science	-11
	In education to occupation in fine arts	+19
	In education to occupation in social science and psychology	+ 5
	In education to occupation as research worker	+43
	In education to occupation in communications	-12
	In education to occupation as computer scientist	+53
	In education to occupation as technician	+11
	In education to occupation in other professional category	- 2
	In education to occupation in nonprofessional category	-10
Industry grouping	Education service to production and trade	+13
	Education service to transportation, communication, utilities	+35
	Education service to insurance, credit, banking real estate	+19
	Education service to entertainment and services (including: personal, business, and repair)	+13
	Education service to health service	+16
	Education service to legal, social and miscellaneous service	+ 6
	Education service to government service	+16
Metropolitan status	Large SMSA (not central city) to not in SMSA	- 2
	Large SMSA (not central city) to small SMSA (central city)	- 4
	Large SMSA (not central city) to small SMSA (not central city)	- 1
	Large SMSA (not central city) to large SMSA (central city)	- 2
Region	Mideast to New England	- 1
	Mideast to Great Lakes	+ 8
	Mideast to Plains	+ 5
	Mideast to Southeast	+ 4
	Mideast to Southwest	+ 7
	Mideast to Rocky Mountains	+ 9
	Mideast to Far West	+11
Major field/ job-related-ness, defined by: Use of major field course-work in principal job	Almost always to frequently	- 1
	Almost always to sometimes	- 2
	Almost always to rarely	- 7
	Almost always to never	-13
College selectivity	Moderately selective to not selective	- 2
	Moderately to highly selective	+ 2
Major	Education to noneducation	+ 7

Before discussing the partitioning, it is important to note that the difference between female actual mean salary ($13,400) and male predicted salary ($16,900) is $3,500 (table 3). The ratio of actual female mean salary to male predicted salary is approximately 80 percent.

In partitioning the log salary difference, first the effect of rate-of-return is accounted for. If average values for female salary-relevant characteristics are used with the regression coefficients in the male model, we see the effect of male rate-of-return on female salary. The expected female salary would increase by $1,500 if females got the same return as males on their salary-relevant characteristics. This implies that, based on this model, the rate-of-return accounts for more than 40 percent of the discrepancy between male and female predicted salaries.

Next, the effect of different salary-relevant characteristics is examined. Still using the male regression coefficients and substituting average male occupational and industry characteristics for the female values results in expected salary increments of $1,000 and $700, respectively. The remaining difference is the expected increment due to all other substitutions to male characteristics.

Males can expect to lose $2,100 (60 percent of their salary advantage) if they earned for their characteristics at the same rate as females. This is seen by using the same approach in reverse (that is, average male salary-relevant characteristics with the female regression coefficients). If the males' occupation distribution were the same as the females', they would expect to lose another $800. Women's industry distribution likewise results in another $400 decrease (table 4).

Both the male and female models show that roughly half the difference in predicted salaries between male and female recent college graduates can be attributed to differences in salary-relevant characteristics (especially occupation) and half to rate-of-return on those characteristics. This result depends upon the variables available from the survey and the regression models chosen. Other studies with different sets of data could result in other findings.

Table 3.-- Expected change in female salary, using male regression model, with female salary-relevant characteristics and selected average male characteristics

Model	Mean salary	Expected change in salary due to model	Ratio of given model to predicted male salary
Actual mean female salary	$13,400	-	0.79
Predicted mean female salary			
Model using male regression coefficients	14,900	+1,500	.88
Model using male regression coefficients and male occupational distribution	15,900	+1,000	.94
Model using male regression coefficients, male occupational distribution, and male industrial distribution	16,600	+700	.98
Actual mean male salary	17,000	+400	1.01
Predicted mean male salary	16,900	-100	1.00

-Not applicable.

Table 4.--Expected change in male salary, using female regression model, with male salary-relevant characteristics and selected average female characteristics.

Model	Mean salary	Expected change in salary due to model	Ratio of given model to predicted female salary
Actual mean male salary	$17,000	-	1.26
Predicted mean male salary			
Model using female regression coefficients	14,900	-$2,100	1.10
Model using female regression coefficients and female occupational distribution	14,100	-800	1.04
Model using female regression coefficients, female occupational distribution, and female industrial distribution	13,700	-400	1.01
Actual mean female salary	13,400	-300	.99
Predicted mean female salary	13,500	+100	1.00

-Not applicable.

Conclusion

This report explores the nature of the salary differences between male and female recent college graduates with three approaches. One is a descriptive approach. Comparing the sexes one variable at a time, it reveals two findings. First, regardless of the background variable, male and female salaries fluctuate in parallel but usually a sizable distance apart. Second, in the high-paying occupation and major field categories, men far outnumber women. In the low-paying occupation and major field categories, women far outnumber men. This partially explains the overall difference in mean male and female salaries.

The descriptive approach is limited by the substantial interrelations among the variables. Since regression analysis controls for this weakness, it contributes the other two approaches. In the first of these, male and female models are established. Then the relative effect of each variable category on salary of an arbitrary reference group is isolated. Focusing on major variables, the reference group for males consisted of bachelor's recipients who experienced a high degree of major field/job-relatedness and were employed in education occupations. The addition of a master's degree for this group would increase their salary 29 percent, while a change to a low degree of major field/job-relatedness would decrease their salary 17 percent. The following occupational changes would increase their salary substantially: to engineer (+53 percent), to computer scientist (+39 percent), and to business and management (+26 percent). The reference group for females also consisted of bachelor's recipients with an occupation in education who experienced a high degree of major field/job-relatedness. The addition of a master's degree for this group would increase their salary by 30 percent, while a change to a low degree of major field/job-relatedness would decrease their salary 13 percent. The following occupational changes would increase their salaries substantially: to computer science (+53 percent), to health (+21 percent), and to business and management (+14 percent).

In the second regression approach, called the decomposition-of-means technique, the difference in predicted mean salary for males and females is divided into two components: one associated with the salary-relevant characteristics (predictor variables in the model), and the other associated with rate-of-return on those characteristics (the regression coefficient associated with each predictor variable). This procedure demonstrates that about half the difference in predicted salary can be attributed to women choosing lower-paying industries and occupations. The other half appears to be attributable to a lower rate-of-return for females compared to males on all salary-relevant characteristics.

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Appendixes

Appendix A contains a description of all salary-relevant variables in the report.

Appendix B contains tables B1-B9, which show the frequency distributions and mean salaries for the salary-relevant characteristics referred to in section II.

Appendix C describes the survey, including the sampling procedures and response rate.

Appendix D contains tables of correlation coefficients as measured by Cramer's V to show the interrelationships among the variables. There is a table for males and one for females. The statistic used (Cramer's V) is closer to unity for variables that are more closely associated.

Appendix E lists tables of coefficients of variation for totals and salaries in tables B1-B9. It includes a description of the purpose of this measure and how to use it.

Appendix F displays the regression coefficients and standard errors for log salaries of males and females.

Appendix A.--Description of Salary-Relevant Characteristics Variables*

(1) Occupation. Fourteen-category variable aggregated from specific codings on the individual record which used the 1970 Bureau of Census Occupational Classification System. The codes were assigned on the basis of self-reported occupation. The categories were: business and management; education; engineering; health occupations; public affairs; biological and physical science; fine arts; social science and psychology; research workers; communications; computer scientists; technicians; other professionals; and nonprofessionals.

(2) Industry Grouping. Eight-category variable: transportation, communication and utilities; insurance, credit, banking and real estate; entertainment and services including: personal, business, and repair; health service; legal, social and miscellaneous service; education service; government service; production and trade.

(3) Marital Status. Two categories: married (living with spouse) and other.

(4) Enrollment Status. Three categories: full time, part time, not enrolled.

(5) Major Field (for degree that brought respondent into survey). Twelve-category self-reported variable aggregated from specific codings on the individual record which used the 1978-79 Earned Degrees Conferred System for classifying of self-reported major. The categories were: business and management; education; engineering; health; public affairs and services; biological sciences; mathematics; physical sciences; psychology; social science; humanities; and other.

(6) Metropolitan Status. Five-category variable aggregated from respondent-reported city, county or town, and State, for principal job. The categories were: not in SMSA, small SMSA (less than 1 million population) - central city; small SMSA - not central city; large SMSA (greater than 1 million population) - central city; and large SMSA - not central city.

(7) Region. Eight-category variable aggregated from graduate self-reported location, i.e., State, for principal job. The categories were: New England, Mideast, Great Lakes, Plains, Southeast, Southwest, Rocky Mountains, Far West.

(8) Major Field/Job-Relatedness. Measured by response to questionnaire item on frequency of use of college courses in major field on the job (five self-reported subjective categories: almost always, frequently, sometimes, rarely, never).

*Specific codes for these variables are available in the tape documentation for the 1981 Survey of 1979-80 College Graduates from the Statistical Information Office, National Center for Education statistics, (202) 254-6057.

(9) Degree Level. Bachelor's or master's. Information came from school and was the degree that brought respondent into the sample.

(10) College Selectivity. Three-category variable (not selective, moderately selective, highly selective) from the American College Testing (ACT) Research Program's College Planning Search Book, 1977-78 edition. This is a composite index based on median Scholastic Aptitude Test (SAT) scores, ACT scores, or both; on the high school grade-point average of the freshman class; and on an "open" admission policy.

(11) Race/Ethnicity. Self-reported and aggregated with four categories: white, black, Hispanic, and other.

(12) Experience. Refers to years of full-time work experience accumulated before receiving the degree that brought the respondent into the sample. The three categories were: less than 1 year, 1-5 years, more than 5 years.

Appendix B. Tables

Table B1.--Frequency distributions and salaries of 1979-80 college graduates, by sex and occupational category: May 1981

Occupational category	Male			Female		
	Number (sample size)	Percent	Mean Salary	Number (sample size)	Percent	Mean salary
Total	376,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
Business and management	105,800 (564)	28	18,000	72,500 (415)	19	15,500*
Education	44,400 (596)	12	14,000	119,900 (2,118)	29	12,700*
Engineering	51,700 (256)	14	23,200	5,500 (27)	1	22,400
Health	7,800 (43)	2	21,000	35,900 (220)	9	16,700*
Public affairs	13,600 (83)	4	12,600	25,100 (170)	7	12,000
Biology and physical science	8,900 (43)	2	17,400	2,900 (16)	1	15,300
Fine arts	8,000 (35)	2	18,000	6,800 (42)	2	14,600
Social science and physics	2,900 (17)	1	16,000	2,000 (12)	-	16,000
Research workers	6,200 (33)	2	14,600	7,300 (35)	2	14,200
Communications	3,300 (17)	1	14,300	6,600 (32)	2	12,200
Computer	16,800 (89)	4	22,500	10,600 (56)	3	18,400*
Technicians	12,300 (75)	3	15,100	14,000 (80)	4	14,100
Other Professional	10,000 (51)	3	14,600	4,200 (24)	1	14,100
Non-professional	84,300 (499)	22	14,700	74,300 (554)	20	13,500*

-Estimated percent less than 0.5.
*Differs significantly from male mean salary at 0.5 level of significance.

Note.--Estimates based on cell size of less than n=40 are not reliable. See appendix E for a complete explanation of how to apply sampling errors to estimates in this report.

Table B2.--Frequency distributions and salaries of 1979-80 college graduates by sex and major field category: May 1981

Major field category	Male			Female		
	Number (sample size)	Percent	Mean Salary	Number (sample size)	Percent	Mean salary
Total	376,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
Business and management	116,500 (547)	31	18,500	60,600 (271)	16	15,200*
Education	48,300 (853)	13	14,700	118,000 (2,561)	31	12,600*
Engineering	51,800 (249)	14	22,400	5,600 (25)	1	23,100
Nursing and health	11,100 (51)	3	20,800	45,100 (229)	12	16,500*
Public service	10,400 (49)	3	16,700	17,700 (90)	5	12,800*
Biological science	16,400 (79)	4	13,200	8,500 (41)	2	11,800
Mathematics	4,600 (23)	1	15,900	4,800 (20)	1	18,700
Physical science	11,400 (50)	3	15,400	4,900 (23)	1	14,900
Psychology	7,300 (36)	2	14,500	17,400 (84)	5	11,600
Social science	29,700 (139)	8	14,700	24,700 (109)	7	11,800*
Humanities	14,300 (63)	4	12,500	31,300 (148)	8	11,400
Other	54,200 (252)	14	15,800	41,000 (200)	11	13,100*

*Differs significantly from male mean salary at 0.05 level of significance.

Note.--Estimates based on cell size of less than n=40 are not reliable. See appendix E for a complete explanation of how to apply sampling errors to estimates in this report.

Table B3.--Frequency distributions and salaries of 1979-80 college graduates, by sex and industrial grouping: May 1981

Industrial grouping	Male			Female		
	Number (sample size)	Percent	Mean salary	Number (sample size)	Percent	Mean salary
Total	376,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
Transportation, communications, utilities	19,100 (104)	5	20,300	12,700 (77)	4	16,700*
Insurance, credit, banking, real estate	28,600 (135)	8	15,600	23,300 (140)	6	13,000*
Entertainment and services, including: personal, business, and repair	39,200 (221)	10	17,900	33,900 (211)	9	13,000*
Health service	18,700 (104)	5	17,000	57,900 (381)	15	15,300
Legal, social and miscellaneous service	44,000 (230)	12	16,100	38,600 (250)	10	13,100*
Education service	54,200 (659)	14	14,200	129,600 (2,248)	34	12,700*
Government service	39,200 (200)	11	17,100	22,200 (126)	6	13,800*
Production and trade	133,000 (748)	35	18,200	61,400 (368)	16	13,300*

*Differs significantly from male mean salary at 0.05 level of significance.

Table B4.--Frequency distributions and salaries of 1979-80 college graduates, by sex, marital status, and enrollment status: May 1981

Characteristic	Male			Female		
	Number (sample size)	Percent	Mean salary	Number (sample size)	Percent	Mean salary
Total	376,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
Marital status						
Married, living with spouse	167,900 (1,113)	45	19,500	135,600 (1,113)	36	14,300*
Other	208,100 (1,288)	55	15,200	244,000 (2,345)	64	13,000*
Enrollment status						
Full time	13,000 (87)	3	12,300	9,500 (114)	3	12,900
Part time	47,500 (322)	13	17,300	46,700 (533)	12	13,400*
Not enrolled	315,500	84	17,200	323,400	85	13,500*

*Differs significantly from male salary at 0.05 level of significance.

Table B5.--Frequency distributions and salaries of 1979-80 college graduates, by sex and metropolitan status: May 1981

Metropolitan status	Male			Female		
	Number (sample size)	Percent	Mean salary	Number (sample size)	Percent	Mean salary
Total	376,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
Not in SMSA	53,600 (474)	14	14,200	63,100 (913)	17	12,000*
Small SMSA (central city)	89,800 (545)	24	16,300	93,000 (838)	24	12,700*
Small SMSA (not central city)	40,500 (309)	11	17,000	34,600 (452)	9	12,500*
Large SMSA (central city)	106,200 (555)	28	18,200	97,900 (712)	26	14,400*
Large SMSA (not central city)	85,900 (518)	23	18,500	91,000 (886)	24	14,700*

*Differs significantly from male salary at 0.05 level of significance.

Table B6.--Frequency distributions and salaries of 1979-80 college graduates, by sex and region: May 1981

Regions	Male			Female		
	Number (sample size)	Percent	Mean salary	Number (sample size)	Percent	Mean salary
Total	376,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
New England	25,100 (152)	7	16,800	22,900 (220)	6	12,900*
Mideast	77,900 (445)	21	17,000	88,500 (761)	23	13,700*
Great Lakes	72,800 (464)	20	17,200	72,200 (747)	19	13,800*
Plains	34,900 (236)	9	16,600	34,000 (373)	9	13,000*
Southeast	65,200 (436)	17	15,200	77,300 (857)	20	12,400*
Southwest	34,800 (267)	9	18,500	38,200 (444)	10	13,700*
Rocky Mountains	15,200 (97)	4	16,000	10,800 (128)	3	13,900*
Farwest	50,100 (304)	13	19,100	35,700 (271)	10	15,000*

*Differs significantly from male salary at 0.05 level of significance.

Table B7.--Frequency distributions and salaries of 1979-80 college graduates, by sex and major field/job-relatedness, defined by use of college courses in major field on the job: May 1981

Use of college courses	Male			Female		
	Number (sample size)	Percent	Mean salary	Number (sample size)	Percent	Mean salary
Total	376,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
Almost always	97,600 (664)	26	17,200	123,800 (1,507)	33	14,200*
Frequently	107,700 (681)	29	18,100	104,700 (1,033)	27	14,000*
Sometimes	95,800 (585)	25	17,600	82,100 (722)	22	13,500*
Rarely	50,900 (303)	14	15,200	45,000 (339)	12	11,900*
Never	24,000 (168)	6	13,500	24,000 (200)	6	10,700*

*Differs significantly from male salary at 0.05 level of significance.

Table B8.--Frequency distributions and salaries of 1979-80 college graduates, by sex, degree, college selectivity, and race/ethnicity: May 1981

Characteristic	Male			Female		
	Number (sample size)	Percent	Mean salary	Number (sample size)	Percent	Mean salary
Total	376,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
Degree						
Bachelor's	285,000 (1,882)	76	15,800	277,800 (3,011)	73	12,400*
Master's	91,000 (519)	24	21,300	101,800 (790)	27	16,800*
College selectivity						
Not selective	76,900 (487)	20	16,900	73,000 (793)	19	13,300*
Moderately selective	227,600 (1,498)	61	16,800	244,200 (2,514)	64	13,300*
Highly selective	71,500 (416)	19	17,700	62,400 (494)	17	14,100*
Race/ethnicity						
White	347,000 (2,208)	92	17,000	344,600 (3,477)	91	13,400*
Black	16,500 (103)	4	15,900	24,300 (229)	6	13,400*
Hispanic	5,700 (48)	2	17,700	5,700 (54)	2	13,000*
Other	6,800 (42)	2	19,200	5,000 (41)	1	15,900

*Differs significantly from male salary at 0.05 level of significance.

Table 89.--Frequency distributions and salaries of 1979-80 college graduates, by sex and by years of full-time work experience: May 1981

Years of work experience	Male			Female		
	Number (sample size)	Percent	Mean salary	Number (sample size)	Percent	Mean salary
Total	396,000 (2,401)	100	17,000	379,600 (3,801)	100	13,400*
Less than 1 year	199,100 (1,290)	53	15,300	229,400 (2,414)	60	12,200*
1-5 years	93,300 (550)	25	17,000	85,900 (812)	23	14,300*
More than 5 years	83,600 (560)	22	21,900	64,300 (575)	17	17,600*

*Differs significantly from male salary at 0.05 level of significance.

Appendix C. Description of the Survey

Sample design and estimating procedures

The sample survey of Recent College Graduates conducted in October 1981 was the source of the data for this report. The survey used a two-stage sampling procedure: the first stage was a sample of institutions offering bachelor's and master's degrees; the second stage was a sample of graduates from the sampled institutions. The institutions were stratified by percent of education graduates, control, and geographic region. The institutions were selected with probabilities proportional to their measure of size, a measure constructed by using the number of graduates and the percent of education graduates.

The graduates within the sampled institutions were stratified by level of degree, whether or not they were education graduates, and by whether or not they were special or vocational education graduates. Different probabilities of selection were assigned to each stratum to obtain the desired sample size of each type of graduate. A questionnaire was mailed to each sampled graduate.

The results of both stages of sampling are shown in table C. The overall response rate was 72.3 percent.

A ratio estimation procedure was used to inflate the sample results to the estimates. The estimates differ from the Higher Education General Institutional Survey (HEGIS) numbers that were the basis for the ratios, because graduates listed with foreign addresses and deceased graduates were removed, and self-reported major was used rather than the institution-reported major.

Table C.--Response rates for the 1981 survey of 1979-80 college graduates

Item	1981 survey
Sampled institutions	301
Out-of-scope institutions	4
Responding institutions	286
Institutional response rate (percent)	96.3
Total sampled graduates	15,852
Out-of-scope graduates	716
Responding graduates*	11,365 (9,312)
Graduate response rate (percent)	75.1
Overall response rate (percent)	72.3

* The number of responding graduates used includes weighted respondents from subsamples of what were originally nonrespondents in the survey. The actual number of completed questionnaires is given in parentheses.

Table D1.--Correlation coefficients among variables (male)

(Cramer's V coefficients)

Variable	Occupation	Industry	Metro-politan status	Region	Major field/ job-related-ness	Degree	College select-ivity	Race/ Ethni-city	Experience	Enrolled	Major field	Marital status
Occupation	1.000	0.408	0.150	0.103	0.212	0.341	0.124	0.106	0.154	0.166	0.426	0.195
Industry		1.000	.151	.098	.170	.344	.129	.070	.122	.086	.345	.191
Metropolitan Status			1.000	.238	.067	.047	.117	.052	.079	.044	.149	.082
Region				1.000	.073	.106	.156	.113	.055	.095	.106	.106
Major field/ job-relatedness					1.000	.173	.074	.053	.075	.064	.170	.128
Degree						1.000	.038	.088	.347	.050	.285	.254
College selectivity							1.000	.092	.094	.036	.125	.074
Race/Ethnicity								1.000	.076	.053	.105	.033
Experience									1.000	.043	.174	.416
Enrolled										1.000	.125	.039
Major Field											1.000	.221
Marital Status												1.000

Table D2.—Correlation coefficients among variables (female)

(Cramer's V coefficients)

Variable	Occupation	Industry	Metro-politan status	Region	Major field/ job-related-ness	Degree	College select-ivity	Race/ Ethni-city	Experience	Enrolled	Major field	Marital status
Occupation	1.000	0.483	0.187	0.116	0.286	0.362	0.144	0.131	0.167	0.135	0.486	0.221
Industry		1.000	.157	.092	.224	.318	.124	.077	.161	.098	.395	.241
Metropolitan Status			1.000	.216	.081	.085	.096	.056	.055	.041	.174	.132
Region				1.000	.070	.081	.108	.134	.075	.077	.104	.076
Major field/ job-relatedness					1.000	.173	.047	.029	.076	.048	.234	.129
Degree						1.000	.008	.024	.469	.026	.287	.224
College selectivity							1.000	.098	.084	.027	.170	.089
Race/Ethnicity								1.000	.071	.055	.117	.036
Experience									1.000	.040	.170	.316
Enrolled										1.000	.102	.028
Major Field											1.000	.240
Marital Status												1.000

Appendix E. Coefficients of Variation for Totals and Salaries for Tables B1-B9

Table E-1 contains coefficients of variation (CV's) for totals. (Note, the CV is merely the standard error of the estimate divided by the estimate). To calculate CV's for totals, follow these steps: Using table E1, find the column which comes closest to the category of graduate for which you want a CV. Keep in mind that all estimates in this report contain both bachelor's and master's recipients (on average, there are three times more bachelor's recipients than master's). For a very conservative CV, use the master's columns; for a conservative, but probably more accurate CV, use the bachelor's columns. (For example, for a conservative CV for the estimate of 72,500 females in business and management occupations, use the bachelor's column for non-education majors.) Calculate the percentage of graduates in class, i.e., the estimate divided by the total master's and bachelor's recipients in this category, or 72,500/(788,500 + 180,900) = 7 percent. Using this percent, locate the CV in the table under the closest row entry for percentage of graduates in class* and the proper group heading. If the percent calculated does not exactly match the row-entry percentage, approximate what the CV should be from the next higher and next lower percents.

Confidence intervals for estimates appearing in this report can be constructed using these CV's. Continuing the example above, the CV for the estimated 7 percent in graduating class is approximately 0.085. Thus, the standard error for this estimate is 6,163 (0.085 x 72,500 = 6,163), and a 95 percent confidence interval is 72,500 $\pm$ 12,326.

To calculate CV's for salaries, the process is similar but simpler. These CV's only apply to salaries in tables B1-B9. Using these tables, find the appropriate sample size for the estimate (n) and then choose the closest category in table E-2. For example, for males in education occupation (n = 596), use the row entry n = 250 or greater with CV = 2.5 percent. The standard error for the salary estimate of $14,000 for this group is $350 (0.025 x $14,000 = $350) and a 95 percent confidence interval is $14,000 $\pm$ $700. It should be noted that these estimated CV's are very approximate, based upon a few CV's calculated from the data. For this reason, any sample size under 40 should be considered subject to relatively high variability.

* When the percentage of graduates in class is less than 5 percent, this table cannot be used.

Table E1.--Coefficients of variation for totals

Percentage of graduates in class	Bachelor's graduates				Master's graduates			
	Total N=905,700	Special and vocational education N=31,900	All education N=117,200	Non-education N=788,500	Total N=282,200	Special and vocational education N=18,900	All education N=101,300	Non-education N=180,900
5	0.086	0.190	0.137	0.099	0.137	0.278	0.161	0.198
10	.059	.132	.096	.068	.094	.193	.111	.136
15	.047	.106	.077	.054	.075	.155	.089	.109
20	.039	.091	.066	.046	.063	.132	.075	.091
25	.034	.080	.058	.040	.055	.116	.065	.079
30	.030	.072	.052	.035	.048	.104	.058	.070
40	.024	.060	.044	.028	.039	.086	.047	.057
50	.020	.052	.038	.023	.032	.073	.039	.047
60	.016	.045	.034	.019	.026	.064	.033	.039
70	.013	.040	.030	.016	.021	.056	.027	.032
80	.010	.036	.027	.012	.017	.049	.022	.026
90	.007	.032	.024	.009	.012	.043	.018	.019
95	.005	.030	.023	.007	.001	.040	.015	.016
100	.003	.028	.022	.005	.006	.032	.013	.012

Table E2.--Coefficients of variation for salary data

n	CV
250 or greater	2.5 percent
50 to 249	5.0 percent
40 to 49	9.0 percent
Less than 40	Use caution in making comparisons

Appendix F: Coefficients and Standard Errors of Log Salary

F1. Male Regression Model

Parameter	Coefficient estimate	Standard error of the estimate
Intercept	9.370	0.032
Major field		
1. Education	0	-
2. Noneducation	-.001	.018
Degree		
1. Bachelor's	0	-
2. Master's	.254	.017
Experience	.032	.004
Experience squared	-.018	.004
Major field/job-relatedness, defined by: use of major field coursework on job		
1. Almost always	0	-
2. Frequently	.006	.017
3. Sometimes	-.009	.018
4. Rarely	-.096	.023
5. Never	-.186	.029
SMSA status		
1. Not in SMSA	-.032	.036
2. Small SMSA (central city)	-.050	.042
3. Small SMSA (not central city)	-.044	.039
4. Large SMSA (central city)	.018	.048
5. Large SMSA (not central city)	0	-
Occupation		
1. In business and management	.230	.52
2. In education	0	-
3. In engineering	.428	.057
4. In health	.467	.121
5. In public affairs and service	-.025	.091
6. In biological and physical science	.233	.101
7. In fine arts	.187	.116
8. In social science and psychology	.055	.179
9. As research worker	.030	.186

-Not applicable

Appendix F1. (continued)

Parameter	Coefficient estimate	Standard error of the estimate
Occupation (continued)		
10. In communications	0.155	0.157
11. As computer scientist	.332	.074
12. As technician	.185	.085
13. In other professional category	.312	.132
14. In nonprofessional category	.183	.053
Race/ethnicity		
1. White	0	-
2. Black	.115	.064
3. Hispanic	.002	.087
4. Other	.168	.134
Industry		
1. Production and trade	.204	.035
2. Transportation, communication, utilities	.253	.045
3. Insurance, credit, banking, real estate	.058	.043
4. Entertainment and services, including: personal, business, and repair	.137	.039
5. Health industry	.049	.047
6. Education service	0	-
7. Legal, social and miscellaneous service	.061	.039
8. Government service	.100	.040
Marital status		
1. Married, living with spouse	.106	.014
2. Other	0	-
Enrollment status		
1. Enrolled full-time	-.169	.034
2. Enrolled part-time	-.025	.019
3. Not enrolled	0	-

- Not applicable

NOTE: Interactions were included in the model, but parameters and effects are not presented here.

Appendix F: Coefficients and Standard Errors of Log Salary (continued)

P2. Female Regression Model

Parameter	Coefficient estimate	Standard error of the estimate
Intercept	9.292	0.015
Major field		
1. Education	0	-
2. Noneducation	.063	.012
Degree		
1. Bachelor's	0	-
2. Master's	.263	.013
Experience	.01	.002
Experience squared	-.007	.002
Major field/job-relatedness, defined by: Use of major field coursework on job		
1. Almost always	0	-
2. Frequently	-.015	.011
3. Sometimes	-.024	.012
4. Rarely	-.070	.017
5. Never	-.135	.022
College selectivity		
1. Not selective	-.020	.011
2. Moderately selective	0	-
3. Highly selective	.017	.013
Metropolitan status		
1. Not in SMSA	-.016	.015
2. Small SMSA (central city)	-.038	.018
3. Small SMSA (not central city)	-.008	.018
4. Large SMSA (central city)	-.024	.020
5. Large SMSA (not central city)	0	-
Occupation		
1. In business and management	.133	.034
2. In education	0	-
3. In engineering	.454	.098
4. In health	.189	.044
5. In public affairs and service	-.110	.051

-Not applicable

Appendix F2. (continued)

Parameter	Coefficient estimate	Standard error of the estimate
Occupation		
6. In biological and physical science	-0.114	0.132
7. In fine arts	.177	.085
8. In social science & psychology	.053	.120
9. As research worker	.361	.118
10. In communications	-.130	.116
11. As computer scientist	.425	.070
12. As technician	.100	.068
13. In other professional category	-.015	.140
14. In Nonprofessional category	-.107	.033
Region		
1. New England	-.005	.020
2. Mideast	0	-
3. Great Lakes	.079	.014
4. Plains	.045	.017
5. Southeast	.039	.014
6. Southwest	.067	.017
7. Rocky Mountains	.086	.025
8. Far West	.104	.019
Race/ethnicity		
1. White	0	-
2. Black	-.033	.039
3. Hispanic	.039	.092
4. Other	.054	.108
Industry		
1. Production and trade	.122	.024
2. Transportation, communications, utilities	.299	.036
3. Insurance, credit, banking, real estate	.178	.030
4. Entertainment and services including: personal, business, and repair	.126	.027
5. Health industry	.145	.026
6. Education service	0	-
7. Legal, social and miscellaneous service	.062	.026
8. Government service	.150	.030

-Not applicable

NOTE.-- Interactions were included in the model, but parameters and effects are not presented here.

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